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# COTTON IN THE SAN JOAQUIN VALLEY

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For the past three years cotton has been grown experimentally at Kearney Ranch, Fresno County, California. It has been grown before in other parts of the Great Valley but this time we have been giving special attention to Egyptian cotton.

The yields during these years are as follows:

	Seed Cotton Pounds per acre		Lint Cotton Pounds per acre	
	Egyptian	Durango	Egyptian	Durango
1915 .....	.....	2420	.....	750 (31%)
1916 .....	1563	2405	440 (28%)	733 (30.5%)
1917 .....	1615	2010	516 (32%)	643 (32%)

The soil upon which this cotton was grown was a heavy sandy loam, not the best soil for cotton. It is rather difficult to prepare well for this crop, nevertheless the stand was good. The crop of 1917 was seeded, the Egyptian on May 9 and the Durango on May 12. Another plot of Egyptian seeded on May 14 lacked many days reaching maturity when caught by the frost. The crop of 1916 was seeded, the Egyptian on April 9 and the Durango on April 18.

The relative coolness and dryness of the early part of the season of 1917 retarded the development of this crop considerably. This is especially true of the crop planted May 14, for which more than six months of growing weather was not sufficient. The latter part of the season was, however, very favorable to cotton because of the lateness of the rains and relatively high temperature in October and November. These factors brought about conditions for checking the growth of the plants and for opening the bolls.

The temperature at the close of the season and the lateness of frosts are not, however, the most important factors in the yield and harvesting of the crop. The prevalence of early fall rains have a more important bearing at this time. Egyptian cotton is easily knocked from the bolls and early fall rains damage the crop greatly. Those who contemplate planting the crop in the middle and lower Sacramento Valley must take note of this. When early rains are

combined with warm weather the cotton continues to grow and the bolls do not open readily.

The water supply for the cotton in question was derived from a high water table. In June and July this free water comes within about twenty inches of the surface, but it is late in rising in the spring. Hence the crop did not get a vigorous start and did not reach advanced growth until early in the summer. It is considered, therefore, that both in respect to soil and moisture our crop did not have reasonably good conditions for growth and development, yet the crop was both of good quality and quantity. Where land is fertile, water and labor are available, and good culture methods are given, it would seem that the outlook for profit in the production of this crop is bright.

It must not be inferred from this that all localities in the valley would produce cotton successfully. For not only is further experimental work necessary, especially related to time and method of planting, but a period of education must be provided for relating to the habits and growth of the plant and its culture. Even though farmers may be familiar with the crop grown in other parts of the country, yet much must be learned regarding irrigation and influence of season on the development of the crop in California.

It is both the desire and the object of the experiment station at Kearney Ranch to direct the way to this better understanding of the crop and its culture. It is also the object of the experiment station to serve as a center for the dissemination of good seed. This year good seed sufficient to plant about seventy-five acres will be produced and already negotiations are under way to secure a gin so that this seed may be available for planting next spring. Mr. Friselle, manager of Kearney Ranch, will plant about eighty acres, and from this planting good seed will be available for all members of the Farm Bureau who may want to engage in this industry.

From experiments quoted above it might seem that there is little choice between the long staple and the short staple cottons. That there is a choice, however, is emphasized when it is remembered that the long staple yields better than the short staple of the cotton belt and brings more than double the price in the market. Recent quotations of the former have been from 60 to 80 cents per pound, while the latter brings from 24 to 27 cents. Moreover, the demands for the long staple type of cotton is increasing rapidly owing to the increase in tire manufacture and to the demands of the War Department for airplane and balloon fabrics.

Again by growing Egyptian cotton our farmers do not compete with the product of the cotton states. In those states owing to seasonal, soil and labor conditions Egyptian is not extensively grown. The ravages of the boll weevil require the production of short season varieties. Moreover, the season in those states otherwise adapted to Egyptian cotton is too short. The only established regions for the production of this type of cotton are the Salt River Valley of Arizona and southern California including Imperial, Palo Verde and Coachella Valleys. From the present outlook it does not seem possible for these regions to fully supply the demands for this staple. The results of the experiments cited above would indicate that many parts of the San Joaquin Valley are adapted to Egyptian cotton and that this valley might be looked upon as a source of future supply. It is also believed that the conditions of climate, soil and water supply of California are such as to cause less danger of fluctuations in yield and quality of fiber and also to give the fiber the distinctive excellence that is required of this type of cotton.

There are certain economic considerations, however, that bear upon the production of this crop which ought to be mentioned. Among the most important of these are the desirability of adopting one type of cotton and continuing in the cultivation of that type, and growing the crop as a home and community enterprise rather than as a single crop enterprise and on a large scale.

If cotton is to be grown as a regular crop in the valley it is important to understand at the outset the necessity of adopting the variety best suited to the conditions of climate, soil, and market and grow that variety to the exclusion of all others. A detrimental influence working in all cotton areas is the diversity of varieties produced. Cotton cross-pollinates readily. Hence when different varieties are grown in the same community crossing is effected both by the wind and insects and this causes deterioration both in the quality and yield of each variety. On the other hand cotton responds readily to efforts of improvement by selection and good culture methods. In fact, in order to keep a variety or strain up to highest qualities of lint and yield it is necessary to practice selection and to follow the best culture methods. The truth of these statements is abundantly borne out by conditions now existing in Imperial Valley where many varieties of cotton have been grown so close together that at the present time there is no variety of cotton possessing superior quality or yield. Under no circumstances whatever should short staple cotton be planted in the San Joaquin Valley.

The San Joaquin Valley has the opportunity of producing a superior strain of cotton for which there is now a good market and for which there is every indication that a good market will continue. This is further emphasized since cotton responds to selection and good culture. With the seed supply cut off from Egypt and Mexico because of insect enemies, growers have the opportunity of producing a strain of seed especially adapted to our valley conditions. It would be well if this valley might be known as the location where the best Egyptian cotton in the world can be produced in quantities sufficient to attract buyers and to bring a reasonable profit to the tiller of the soil.

It is not to be understood by what has been said that other varieties of cotton will not do well. Our experiments show that they will, but what is the use of growing a variety that does not yield materially more and for which a much less price is obtained? It is true that Egyptian cotton is more difficult to pick than upland cotton, the process costing fully twice as much; but this extra cost is not sufficient to cover the margin of price in favor of Egyptian cotton, at least according to the present outlook. Since Egyptian cotton is ginned by what is known as the roller gin the process is slower, hence the cost of ginning of this staple is greater than is the cost of growing upland staples which are ginned more rapidly by the saw gin.

In the production of cotton it is very desirable that it shall be an interest of the community. This is emphasized because of the fact that the ginning of the lint can be best accomplished by the community. It is true that small gins can be erected on farms of forty acres or more, but the larger gins with power appliances that can handle the cotton of a community are more economical in their operation. Then, too, the utilization of the seed for oil and meal manufacture is an important enterprise for the interest of the community.

Considering all things in the interest of this crop and the agriculture of the valley it would seem that the best line of procedure for the years to come consists in making cotton a part of the acreage of the home farm. It would seem advisable that each family farm possess from three to fifteen acres of this crop according to the number of children or other available labor constantly employed. This point of view is especially important in consideration of the maintenance of crop producing power of the soil and the problems of labor. One of the significant features of California Agriculture is the readiness with which cultivated lands decline in productivity when not prop-



erly handled, especially those not supplied with water for irrigation. The truth of this statement is indicated by the rapid decrease of our grain acreage and yields and the shifting of agricultural activities. This condition may be met and remedied by two lines of procedure, namely by the diversification and rotation of crops with the stimulus of chemical fertilizers and lime when necessary, and by the keeping of a well balanced number of livestock upon the land.

I am advocating the production of cotton therefore primarily because it enters into this scheme of better and permanent agriculture, and it is withal a profitable crop. The deep rooting nature of the plant requiring good preparation of the land, its water requirements, necessitating the judicious use of water and its conservation by culture methods render this crop a valuable one in maintaining fertility of the soil, especially if the meal from the seed were fed to livestock kept in the community and provided also that the stalks be not burned but disked and returned to the soil. The composition of the crop is approximately as follows, in pounds per acre:

	Nitrogen	Phosphoric Acid	Potash	Total
Lint, 500 lbs. ....	1.69	.49	2.23	4.41
Plant, 1500 lbs. ....	33.44	13.08	24.82	71.34
Seed, 1076 lbs. ....	33.96	13.67	12.58	60.21
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Total .....	69.09	27.24	39.63	135.96

Cotton enters well into several rotation schemes. It follows well after beans and is especially fitted to precede grain because of its requirements of well prepared soil and good culture. Except on poor lands it may not follow alfalfa because the abundance of nitrogen tends to stimulate vegetative growth under irrigation. This reduces yield of lint and prolongs the growing season.

The growing of cotton upon home farms and in such areas as can be taken care of by the family and such hired labor as is regularly employed is a recommendation in accordance with the economic production of this crop. In this scheme there is an almost certain family income and the crop permits of a diversification that is advantageous, and all this without altering materially the labor situation. It should be said in this connection also that Egyptian cotton is more sure to bring some returns under our valley conditions than almost any other crop. To be sure it is not a "fool-proof" crop; knowledge of its habits and growing needs and attention to them is important, but this type of cotton is hardy and will withstand unfavorable conditions to a marked degree during the growing season.

What I have said must not be taken as an argument against the growing of cotton in large areas and by those who devote their time and attention to nothing else. Indeed, this procedure is to be encouraged especially at this time when the country is in need of the staple and the prices are good. But over a period of years the large integral enterprise is constantly facing labor problems and it usually results in a continuous cropping which is not in the interests of permanent agriculture with homes upon the land. It should be stated, however, that if the cotton crop is planted timely and properly cared for the peak loads of labor do not conflict materially with those of any other crop. Beet thinning in the spring and beet and raisin harvesting in the fall are the principal periods when labor may be in great demand, but it is believed to be possible to handle these crops in such a way that no serious conflict may occur with the labor demands of cotton.

Cotton production in California is not a new industry. The crop began to attract attention in 1856 when the California State Agricultural Society offered a large prize for the best acre of cotton. In 1862 an aggregate of \$6500 was offered in premiums for cotton in lots of 100 bales. The prize was awarded in 1865 when a farmer in Los Angeles raised 108 acres. In 1869, 34 bales of cotton were produced in San Diego County and in 1873 between 1500 and 2000 acres were grown in Merced County, and more than 22,000 pounds were shipped to Liverpool.

From time to time cotton has been produced successfully in the following counties: Shasta, Butte, Colusa, Lake, Sutter, Yolo, Sacramento, Merced, Fresno, Kings, Tulare, Kern, Los Angeles, San Bernardino, Riverside, San Diego, and Imperial. Other counties in which the crop may do well as Tehama, Glenn, Sonoma, Napa, Solano, Contra Costa, San Joaquin, Alameda, Santa Clara, Stanislaus, Madera, San Luis Obispo, Ventura, and Orange.

Cotton may be grown on a wide range of soils. Being a tap-rooted plant it derives its moisture and food from a considerable depth of soil, consequently preparation of the land is of greater importance than type of soil on ordinary agricultural soils. Soils bearing more than one-half of one per cent of total alkali salts in the surface foot should be avoided or tried out experimentally before planting on a commercial scale. The best soils are the silt and sandy loams without hard pan. The light sandy soils do not have a constant moisture holding capacity and the heavy clays and adobes have poor penetra-

tion for moisture, consequently success on these extreme types may not be great.

Thorough preparation is a very essential factor related to cotton production. Fallowed lands are best, but the land may be plowed in the fall as soon as moisture conditions are right, and left rough during the winter. It should be worked to a fine tilth and an even surface in the spring, going over it several times, first with disk and afterwards with spring and spike tooth harrows.

On the heavier soils it seems advantageous to throw the land into ridges about three and one-half feet apart before planting. This operation permits of greater facility in irrigation and also permits of retaining the water on the land longer than would be possible in case of flooding. On subirrigated lands and those of light texture level planting is best.

It is very important that a good stand of cotton be obtained. On well prepared land where moisture conditions are optimum fifteen pounds of seed per acre are sufficient but where physical conditions of soil and moisture are not as good as could be expected twenty pounds would be better. As soon as the plants are all up so that the rows can be readily followed the plants should be thinned to twelve inches apart in the row. Cultivation should continue throughout the growing season as conservation of moisture, destruction of weeds and the physical condition of the soil require.

The water requirements of cotton are not excessive but it is important that the water supply be sufficient and constant. On light and porous soil the amount required to produce the crop will range from twenty-four to thirty-two inches. On more retentive soils a lesser amount will be required according to the preparation of the land and the seasonal rainfall.

Land in which cotton is planted should be in optimum moisture content at the time of planting. If such is the case no further watering will be required or should be given during the following five or six weeks. If water is applied too freely in the earlier stages the plant will start into vegetative growth and will not set squares abundantly. After the first six or eight weeks water should be applied often enough to keep the plant in good vigor. It is especially important that the moisture content of the soil be kept uniform throughout the zone in which the plant feeds, for if the plant has to meet a deficiency of moisture and alternately an abundance it may fail to form squares or drop those it has already set. If the leaves of cotton appear wilted in the morning it is a good sign that water is

wanted. The later part of June and July are the critical periods, after which water should be withheld or used sparingly. In this way the plants will cease growth and the bolls will ripen and open normally. In sections where fall rains are prevalent the plant may continue to grow until frost and a nonuniform crop result.

No machine has been produced to pick cotton successfully, hence hand picking must be depended upon. Usually three pickings are necessary to harvest the entire crop, the first occurring in the latter part of September or early October. While a few days delay may be given yet the crop should be picked as promptly as possible for the cotton may be knocked from the bolls by wind and become contaminated by trash or dirt.

The cost of raising cotton varies widely, especially while the industry is new and adequate information has not been accumulated by experience. The cost of preparing the land, seed, water and labor to bring the crop to maturity will cost between eighteen and twenty-five dollars. The cost of picking will depend upon the yield and quality of plant growth. Egyptian cotton is somewhat more difficult to pick and the work goes more slowly than upland cotton. The first picking of Egyptian cotton will, at the present prices of labor, cost about four cents per pound. The second picking should cost less and the third picking will often be as high as five cents. The cost of picking the crop will average about four and a half cents per pound under present conditions.

In order to make cotton a permanent crop of value to the agricultural welfare of California a constructive policy should be adopted embodying the economic features of labor, community organization and education and the cultural features embodying land preparation, planting, cultivating, irrigating, harvesting, and crop improvement. The Division of Agronomy of the College of Agriculture desires to be of any service possible in this programme.